CLAIMS

What is claimed:

1. A method of forming a contact in a thin-film device comprising:

forming a liftoff stencil;

depositing at least one material through the liftoff stencil;

removing a portion of the liftoff stencil;

forming a re-entrant profile with the remaining portion of the liftoff stencil; and

depositing a conductor material in contact with the at least one material on the re-entrant profile.

2. The method of claim 1 wherein the thin-film device is a magnetic random access memory device.

3. The method of claim 1 wherein forming the liftoff stencil further comprises:

utilizing at least one layer of photo-resist to form the liftoff stencil wherein the liftoff stencil includes an undercut.

4. The method of claim 2 wherein forming a re-entrant profile further comprises:

swelling a top portion of the at least one layer of photo-resist.

5. The method of claim 2 wherein depositing at least one material through the liftoff stencil further comprises:

depositing TMR junction material in contact with a previously deposited bottom conductor material.

6. The method of claim 3 wherein the at least one layer of photo-resist further comprises a first layer of photo-resist and a second layer of photo-resist.

7. The method of claim 3 wherein forming the liftoff stencil further comprises:

utilizing a dielectric material to form a portion of the liftoff stencil.

8. The method of claim 4 wherein swelling a top portion of the at least one layer of photo-resist further comprises:

soaking the at least one layer of photo-resist in a chlorobenzene solution.

9. The method of claim 4 wherein swelling a top portion of the at least one layer of photo-resist further comprises:

annealing the at least one layer of photo-resist at a temperature sufficient to reflow the at least one layer of photo-resist.

10. The method of claim 6 wherein removing a portion of the liftoff stencil further comprises removing the first and second layers of photo-resist.

11. The method of claim 7 wherein a thickness of the dielectric material is more than a thickness of the at least one material.

12. The method of claim 10 wherein the liftoff stencil comprises the at least one photo-resist material in contact with the dielectric material and forming a re-entrant

profile further comprises:

depositing a layer of material over the at least one photo-resist material wherein the layer of material comprises at least one of SiO_2, Al_2O_3, Si_3N_4 or Ta_2O_5;

soaking the liftoff stencil in a chlorobenzene solution.

13. The method of claim 10 wherein the liftoff stencil comprises the at least one photo-resist material in contact with the dielectric material and forming a re-entrant profile further comprises:

depositing a layer of metal over the at least one photo-resist material;

oxidizing the metal layer; and

soaking the liftoff stencil in a chlorobenzene solution.

14. The method of claim 13 wherein depositing a conductor material further comprises:

utilizing a highly directional etch process to remove a portion of the oxidized metal layer;

removing the at least one layer of photo-resist; and

depositing a top conductor.

15. A system of forming a contact in a thin-film device comprising:

means for forming a liftoff stencil;

means for depositing at least one material through the liftoff stencil;

means for removing a portion of the liftoff stencil;

means for forming a re-entrant profile with the remaining portion of the liftoff stencil; and

means for depositing a conductor material in contact with the at least one material on the re-entrant profile.

16. The system of claim 15 wherein the thin-film device is a magnetic random access memory device.

17. The system of claim 15 wherein the means for forming the liftoff stencil further comprises:

means for utilizing at least one layer of photo-resist to form the liftoff stencil wherein the liftoff stencil includes an undercut.

18. The system of claim 16 wherein the means for depositing at least one material through the liftoff stencil further comprises:

means for depositing TMR junction material onto a previously deposited bottom conductor.

19. The system of claim 17 wherein the at least one layer of photo-resist further comprises a first layer of photo-resist and a second layer of photo-resist.

20. The system of claim 17 wherein the means for forming the liftoff stencil further comprises:

means for utilizing a dielectric material in to form a portion of the liftoff stencil.

21. The system of claim 17 wherein the means for forming a re-entrant profile further comprises:

means for swelling a top portion of the at least one layer of photo-resist.

22. The system of claim 19 wherein removing a portion of the liftoff stencil further comprises removing the first and second layers of photo-resist.

23. The system of claim 20 wherein a thickness of the dielectric material is more than a thickness of the at least one material.

24. The system of claim 21 wherein the means for swelling a top portion of the at least one layer of photo-resist further comprises:

means for soaking the at least one layer of photo-resist in a chlorobenzene solution.

25. A method of forming a contact in a magnetic random access memory device comprising:

forming a liftoff stencil with at least two layers of photo-resist wherein the liftoff stencil includes an undercut;

depositing TMR junction material through the liftoff stencil in contact with a previously deposited bottom conductor;

depositing a hardmask layer through the liftoff stencil and in contact with the TMR junction material;

removing at least one of the at least two layers of photo-resist;

forming a re-entrant profile with a remaining portion of the liftoff stencil; and

depositing a top conductor material in contact with the hardmask layer on the re-entrant profile.

26. The method of claim 25 wherein forming a liftoff stencil further comprises:

utilizing a dielectric material to form the liftoff stencil.

27. The method of claim 25 wherein forming a re-entrant profile with a portion of the liftoff stencil further comprises:

swelling a top portion of one of the at least two layers of photo-resist.

28. The method of claim 26 wherein forming a re-entrant profile further comprises:

depositing a layer of material over the at least one photo-resist material wherein the layer of material comprises at least one of SiO_2, Al_2O_3, Si_3N_4 or Ta_2O_5; and

soaking the liftoff stencil in a chlorobenzene solution.

29. The method of claim 26 wherein the liftoff stencil comprises the at least one photo-resist material in contact with the dielectric material and forming a re-entrant profile further comprises:

depositing a layer of metal over the at least one photo-resist material;

oxidizing the metal layer; and

soaking the liftoff stencil in a chlorobenzene solution.

30. The method of claim 27 wherein swelling the top portion of one of the at least

two layers of photo-resist further comprises:

soaking the one of the at least two layers of photo-resist in a chlorobenzene solution.

31. The method of 29 wherein depositing a conductor material further comprises:

utilizing a highly directional etch process to remove a portion of the oxidized metal layer;

removing the one of the at least two layers of photo-resist; and

depositing a top conductor.